

The Summer Undergraduate Research Fellowship (SURF) Symposium
6 August 2015
Purdue University, West Lafayette, Indiana, USA

Membrane Pre-treatment Using Chemical Disinfectants in Halide Impaired Waters

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ABSTRACT

The use of membrane filtration processes for desalination, water reuse, and water reclamation techniques are becoming more prevalent given freshwater shortages. However, the treatment of these waters is challenging because of the membranes used in these processes. During nanofiltration and reverse osmosis the membranes undergo biofouling. Reverse osmosis and nanofiltration are high-pressure membrane filtration techniques that treat seawater, brackish waters, and industrial wastewaters. Because of the biofouling, the polyamide thin film needs to be pretreated with chlorine (HOCl/ OCl-) as a disinfectant, but this damages the polyamide membrane. When the free chlorine is in the presence of halide-impaired waters, it changes the chemistry of the membrane thus continuing to damage it. In order to find how halide concentration and other water quality parameters affect nanofiltration and reverse osmosis, this project requires liquid chromatography and mass spectrometry method to analyze different aromatic amine compounds (e.g. benzanilide) with similar structures to the polyamide membrane. The LC/MS is optimized in order to find the limits of detection for each of the compounds. The chlorination reactions are done to quantify how much these compounds react in the presence of free chlorine. Future research with regards to this includes kinetic measurements of compound degradation and by-product formation to see how these compounds are affected by free chlorine over time.

KEYWORDS

Nanofiltration, Reverse Osmosis, Liquid Chromatography, Mass Spectrometry, Biofouling